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Penetrating cardiac trauma: A retrospective case series from Karachi

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Abstract

Penetrating cardiac trauma is a medical emergency that commonly affects young men throughout the world. A retrospective review of the records of all patients presenting with cardiac injury was done from January 2000 to December 2015 at our institute. There were 10 cases of such trauma, all of whom were males, 17 to 48 years of age. The most common mechanism of injury was gunshot wounds followed by stab wounds. The Mean Revised Trauma Score was 7.23±0.855. Only 2 out of the total 10 patients died (20% mortality). The Right Ventricle followed by the Left Ventricle was the most common site of injury. Median Sternotomy was the surgical procedure of choice in managing these patients. Pericardial tamponade and Haemothorax were common intra-operative findings. Patients having penetrating cardiac injury presenting with detectable signs of life on arrival to the hospital can be rescued by early surgical intervention.

Keywords: Cardiac Trauma, Stab Wound, Median Sternotomy.

Introduction

Penetrating cardiac trauma is a medical emergency that commonly affects young men throughout the world and usually occurs due to a gunshot, stab injury or shrapnel from explosives. Only 6% of all patients with this condition reach the hospital in time to be saved.[1] However, with the increasing use of rapid medical transportation systems, swift diagnosis and management; survival rates are improving. One study from Karachi reported that 7.6% of all stab wound deaths involved the heart.[2]

The overall mortality rate of patients reaching the hospital with penetrating cardiac trauma throughout the world varies from 15% to 59%,[3] since it primarily depends on the condition in which the patient arrives. Diagnostic procedures have evolved with improvement in emergency medical services, from being a solely clinical diagnosis to now including: Focused Assessment Sonography for Trauma (FAST), cardiac echocardiogram and Multi-slice CT scan.

Local literature has touched the topic of cardiac injuries with studies exploring blunt cardiac trauma and the impact of prehospital time on management of such patients. With this study, the authors hope to add a new dimension to the available literature by analyzing the presentation and management of patients with penetrating cardiac trauma.

Case Series

This case series included all the patients who presented to the Cardiothoracic Surgery department at our tertiary care center (AKUH) with penetrating cardiac trauma regardless of whether they underwent surgery. ERC (Ethics Review Committee) approval was taken prior to collecting the data. Patient files were extracted using ICD-9 code 861.00-13 from January 2000 to December 2016. Data was entered and analyzed by using SPSS version 20 (IBM, Chicago, USA). Outpatient & inpatient records were studied and Intra-operative data was collected from surgical notes. Echocardiogram reports were also reviewed. Follow up out-patient and in-patient consultation notes were studied for any late complications.

The Physiological index (PI) of the patients was defined as follows: Those in stable condition=5, conscious with systolic blood pressure less than 80 mmHg=10, semiconscious patients with thready pulse, gasping respiration and no measurable blood pressure=15 and unconscious patients with no vital signs, respiratory effort, physical activity but with some sign of life in transit to hospital to having the highest PI score of 20.[4]

Results

A total of 10 cases with penetrating cardiac injury were identified. All cases were males with a mean age of 34.0 ±10.6 years. Only 2 patients were brought to our institute directly, the rest were referred from other hospitals. Gunshot wounds were the predominant mode of injury in 6 cases followed by Bomb Blasts and Stab wounds in 2

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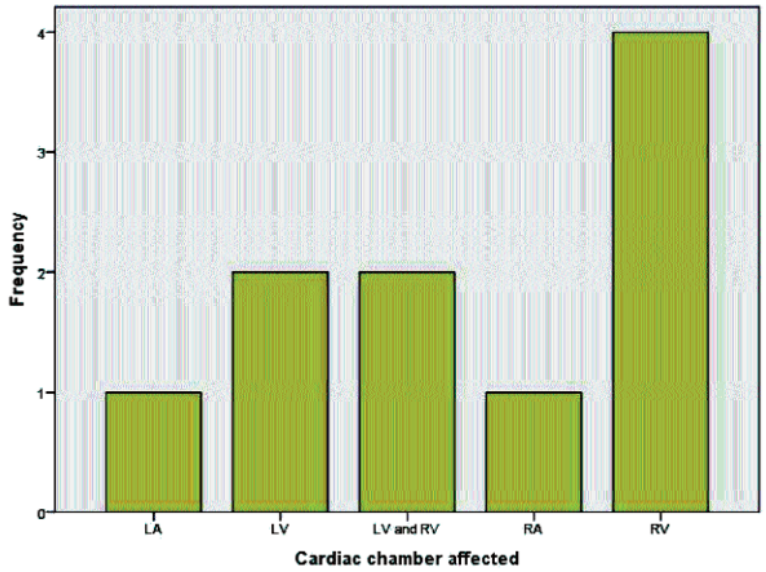
Table: Patient Demographics and Clinical Characteristics.

Mean Age (Mean ± SD)	34.0 ± 10.6
Age (range)	17-48
Sex	
Male	10/10
Mechanism of Injury; n(%)	
Gunshot	6(60%)
Bomb Blast	2 (20%)
Stab Wounds	2 (20%)
Heart Rate (Beats/minute)	115.2 ± 19.2
Respiratory Rate	23.9 ± 10.5
Glasgow Coma Scale Score	12.3 ± 4.52
Blood Pressure (mm Hg)	
Systolic	125.2 ± 21.4
Diastolic	79.6 ± 18.9
Revised Trauma Score	7.23 ± 0.85
Haemoglobin (g/dL)	10.5 ± 2.09
Haematocrit (%)	31.6 ± 6.24
Physiologic Index	9.00 ± 5.68
Distribution by group, n(%)	
Group 1 (5)	6 (60%)
Group 2 (10)	1 (10%)
Group 3 (15)	2 (20%)
Group 4 (20)	1 (10%)
Associated Injury, n(%)	
No Injury	5 (50%)
Lung	2 (20%)
Brain, Lung and Liver	1 (10%)
Lung And Liver	1 (10%)
Liver And Right Femur Fracture	1 (10%)
Hospital Stay (Days)	12.8 ± 9.9
Range (days)	1-34
Mortality, n (%)	2 (20%)



(LV= Left Ventricle, RA= Right Atrium, RV= Right Ventricle, LA= Left Atrium)

Figure: Cardiac chambers affected.

cases each. In 9 out of 10 cases, the manner of injury was homicide, with 1 case reporting an accidental gunshot injury. All entry wounds were in the anterior chest, with 3 patients having exit wounds in the posterior chest (Table).

Two of the 10 patients were clinically unstable at presentation. One of them had cardiac arrest and was revived with CPR. The second patient, who was a bomb blast victim, had a low GCS score (7/15) at the time of admission. Ketorolac, IV Antibiotics and Tetanus Toxoid were the 3 most common medications used in the initial management of patients. The Revised Trauma Score mean was 7.23±0.86. The mean Physiologic Index was 9.00±5.68. The mean haemoglobin at the time of admission was 10.5±2.09 g/dL with a mean haematocrit of 31.6±6.24%. Five out of 10 patients had associated injuries, with lung and liver being the most commonly affected organs in addition to the heart.

Nine patients underwent a surgical procedure during their course of management, with 1 patient refusing surgery and leaving against medical advice. Median Sternotomy was the most commonly used procedure, performed in all patients undergoing surgery. One patient required cardiopulmonary bypass. The most frequently damaged cardiac chamber was the right ventricle (4/10) followed by the left ventricle (2/10). Two patients had both left and right ventricles damaged concurrently whilst the left atrium and right atrium were damaged in 1 patient each (Figure). Pericardial effusion was discovered intra-operatively in 5 of the 9 patients undergoing surgery. The volume of blood ranged from 200 to 1000 ml of blood in the pericardial cavity. Haemothorax, occurred in 4/9 patients. All patients were extubated within 24 hours except one who was extubated at 48 hours.

Post operatively 5/9 patients had no complications. One bomb blast victim suffered from Acinetobacter infection of the right lung and was subsequently treated with antibiotics. Another patient developed pleural effusion post operatively and was treated with chest tube insertion. One gunshot wound victim presented with haemodynamic shock, haemothorax and liver injury. Post-operatively he developed repeated ventricular fibrillations and could not be revived despite cardioversion. The second patient, also a gunshot victim presented in extermis with no pulse or blood pressure reading. CPR was done and the patient rushed to surgery. The anterior, posterior and inferior wall of the right ventricle was found to be completely shattered along with profuse bleeding. Post

operatively the patient developed seizures. CT scan revealed hypoxic ischaemic brain injury that ultimately led to the patient's demise. The remainder 8 patients were vitally stable at the time of discharge. The mean number of days for hospital stay was 12.8 ±9.9 days. The follow up duration of these patients ranged from 3 days to 3 years.

Discussion

All of the patients in our series were young males, a finding similar to other studies.[1] The mortality rate in our series was low compared to literature,[5] most likely due to patients with better prognosis presenting to the hospital to begin with. Our mortalities were from gunshot wounds considering their high kinetic energy that causes increased tissue damage.[6] The revised trauma score on initial assessment of the patient serves as an excellent predictor of patient mortality.[7] In our series the mean revised trauma score in the ER was high, a good indicator of outcome as evidenced with the low mortality. The respiratory system and the abdomen were the sites most commonly affected in association with penetrating cardiac trauma in our series, a result similarly seen in other studies.[8]

The most commonly affected site of penetrating cardiac trauma in our case series was the right ventricle followed by the left ventricle, right atrium and left atrium; very similar to results from other studies.[3] The frequency of cardiac chambers involved depends on their anatomical site with the right ventricle, due to its anterior anatomical position, being the most frequently affected. A significant number of patients in our series had pericardial tamponade upon surgical exploration. One study reported that patients are more likely to survive if they present with cardiac tamponade.[9] It is generally believed that up to a certain point, pericardial tamponade has a protective effect and prevents haemorrhage from the cardiac wound, possibly saving the patient's life.[8]

The majority of cases with penetrating cardiac injuries are managed mainly at public sector hospitals in the city[10] due to the high cost of treatment among other issues, limiting the volume of patients presenting with this injury at our center. Furthermore, the retrospective nature of this study was another limitation.

Conclusion

Penetrating cardiac trauma commonly affects young males with gunshots being the commonest mechanism. Patients presenting with detectable signs of life on arrival to the hospital can be rescued by early surgical intervention. Median sternotomy is the procedure of choice in these patients.

Disclaimer: This article is not being considered for publication elsewhere.

Conflict of Interest: The authors declare that we have no competing interests.

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